FEMtools™ Framework

An Interactive Desktop and Scripting Environment for Engineering Analysis and CAE Process Automation

FEMtools Framework is a multi-functional interactive environment for advanced engineering application development, integration, and automation. The framework includes data interfaces, database management utilities, mesh generation and manipulation tools, parameter and response management, state-of-the-art data visualization, plus a full featured scripting language and API function library.

Optionally, FEMtools Framework includes a standard finite element library and solvers for linear static and normal modes analysis. Alternatively, standard external solvers like NASTRAN, ANSYS, I-DEAS, ABAQUS or in-house solvers can easily be integrated and piloted as part of larger analysis processes.

This open and flexible CAE application development platform is used by analysts to integrate their tools, and create vertical applications that meet the specific requirements of an industry. A unique capability of FEMtools Framework is the integration of data resulting from experimental static or dynamic testing.

Key Features

- Convert finite element and test data into a uniform, structured relational database.
- Analyze, visualize, manage and report your engineering simulation and test data.
- Solve for static and dynamic responses using built-in solvers or by piloting external solvers.
- Use FEMtools Script with hundreds of built-in math and API functions to access all data and create your own functions and programs.

Applications

FEMtools Framework is a software-neutral CAE application development tool mainly used for developing tools that exploit hybrid test and analysis databases. It provides the foundation for all FEMtools products and for products developed by independent partners.

As a stand-alone tool, FEMtools Framework can be used as a utility software for

- Data management, translation and transformation
- Pre- and postprocessing of FEA and test data.
- CAE process integration and automation.
- Development of vertical applications.

Benefits

- Faster and more efficient development.
- Re-use of standard components like graphics viewers and data translators.
- Customized user interfaces.
- Solver-neutral integration with virtually every FEA package.
- Integration with virtually all types of test data.
- Computing and OS platform-independent applications.
- The programming language and API provide a layer between the database and applications. This reduces the risk of corrupting the database.
- By using a common development platform it becomes easier to develop new functions in collaboration with partners or subcontractors.

Framework Components

- Direct data interfaces.
- Database management tools.
- Mesh generation and morphing tools.
- Mesh quality analysis commands.
- Parameter and response management commands.
- Interactive user interface.
- Graphics viewers.
- FEMtools Script language.
- FEMtools API function library.
- Finite element library and solvers.

Direct Data Interfaces

- Optional integrated direct, bi-directional interfaces
  FEA : NASTRAN, ANSYS, I-DEAS , ABAQUS, …
  Test: Universal File, Custom file formats.
- Direct import/export of data tables (Excel, Matlab,…).
- No limitation of FE model size.
- Transformation of external databases into an internal relational database.
- Automatic creation of sets of elements based on topology, material or geometry.

Database Management Tools

- Database explorer using tree-lists.
- Spreadsheet-style table editing.
- Transformation of coordinate systems.
- Support of local coordinate systems.
- Conversion of engineering units.
- Modal database normalization, scaling, truncation and expansion.
- Creation of element and node sets based on properties or by graphical picking.
- Boolean operations on sets.
- Verification of FEA database integrity.
- Conversion between element types.
- Regrouping of elements.

FEMtools
simulate > validate > update > optimize

Mesh Tools

- Mesh generation and morphing function library.
- Mesh quality analysis tools.

Parameter and Response Selection

- Selection of all element material properties, geometrical properties, boundary conditions, lumped masses, and damping factors as parameters.
- Selection of mass, static and dynamic displacements, resonance frequencies, modal displacements, MAC, FRFs, and FRF correlation functions as responses.
- Lower and upper bound constraints.
- Definition of parameter relations.

Interactive User Interface

- Customizable menus, toolbars and shortcuts.
- Complete online documentation.
- Journal and log file for session replay.
- Progress indicators, and cancel button.
- Report generator (HTML).
- Floating and dockable toolbars.
- Multiple graphics, table and editor windows.
- Console window for commands and feedback.

Graphics Viewers

- XY-curves, matrix and mesh visualization.
- Graphical picking of nodes and elements.
- Dynamic viewing (rotation, pan and zoom).
- OpenGL graphics rendering.
- Color-coded and vector-coded displays.
- Animated, side-by-side and overlay plots.
- Export of animated shapes as AVI files.
- Export graphics to various graphics file formats.

FEMtools Script Language

FEMtools Script is a rapid scripting language that is adapted to the needs of simulation engineers. Scripts can be used to add, customize or automate about any imaginable task.

- Compiled byte-code for fast execution.
- Integrated script editor with color coding.
- Functions for mathematical programming (array operators and functions, sparse matrices, regular expressions, set manipulation, …).
- Functions for integrating with third party tools (exchange of matrices with Matlab or MS Excel, launching and controlling subprocesses,...).
- Functions for user interface development (graphical picking, dialog boxes, explorer,…).
- Script encoding for protecting intellectual property or ensuring source code integrity.

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FEMtools API Function Library

The FEMtools API is a library of functions that can be used from within script programs to access FEA data or test data, re-use built-in solvers and analysis tools, user interface development, and pilot external CAE or test tools.

- 280+ FEMtools API functions for database access, mesh generation, mesh manipulation, UI programming, and process control.
- Access to all FEMtools data interfaces, database management, analysis modules and graphics.

Finite Element Library and Solvers

- Internal finite element library (lumped mass, beams, plates, shells, volume elements, damper element).
- Isotropic, orthotropic and anisotropic material models.
- Constraint equations (MPC, RBE2, RBAR,...)
- Linear static analysis.
- Normal modes analysis (Lanczos solver).
- Use integrated FEMtools solvers or pilot third party solvers.
- Upgrade path to FEMtools Dynamics for advanced dynamics simulations.

Options

- Upgrade to FEMtools Dynamic, FEMtools Correlation, FEMtools Model Updating and FEMtools Optimization.
- NASTRAN, ANSYS, ABAQUS and UNIVERSAL FILE interfaces and driver.

Services

- Regular software maintenance.
- Installation, training and customization.
- Support by e-mail, fax and phone.
- Internet support site.
- Custom software development.
- Project research.
- Engineering services.

Supported Platforms

- Window XP, XP Pro, Vista/7/2003/2008 32-/64-bit
- Unix (HP-UX, IBM AIX, SUN Solaris)
- Linux (32-bit and 64-bit)

Flexible node-locked or floating licensing of annual or paid-up licenses. For more information, contact us at

Dynamic Design Solutions
CAE Software and Services

Interleuvenlaan 64, B-3001 Leuven, Belgium
Voice +32 (0)16 40 23 00
Fax +32 (0)16 40 24 00
info@femtools.com - www.femtools.com